

not crumble, and will become firmer by drying. Shales containing iron pyrites are liable to crumble from oxidation.

Shales work easier when first taken out, as they are wet, but are more liable to crumble in splitting. While drying out lines of cleavage are developed, showing where to put the chisel to expose the best impressions. Promising shale can be stored away in a dry place and worked over at leisure. Different species occur in the shale at different levels, and experience soon teaches one how to work the shale for particular forms.

For collecting fossils, one needs a crow-bar, shovel or spade, pickaxe, and blasting material, if he is searching at a locality not worked. If at a mine in operation the above tools, if needed, can generally be borrowed from the miners. Several steel chisels from $\frac{1}{2}$ to 1 inch wide and 8 inches long, and as thin as possible, are necessary, also one heavy and one light hammer. In splitting small shales a strong butcher knife and a light hammer have been used to good purpose. In opening large shales to expose surfaces it is best to insert several chisels along the supposed line of fracture and work continuously. The impressions should never be touched with the fingers as they are easily dimmed. Cigar boxes for small specimens and fragile pieces, and larger boxes for heavier shales are necessary. All specimens should be wrapped in paper and tightly packed on edge, and all the interstices filled with paper, sawdust, leaves or any available packing material.

Essential requisites in forming a cabinet of fossil plants are patience and perseverance on the part of the collector. He must be content to split shale all day in the hot sun or bitter cold, and often go home with empty boxes. Specimens in the cabinet should be laid flat in drawers, such as are used for minerals, or in show cases, if designed for exhibition. They are necessarily fragmentary, and a number of specimens of each form is desirable. The specimens must be numbered, to correspond with those of a record book, in which all data are given. A card placed with each specimen states where it is figured and described, and the front of the drawer is labeled with the contained genus and species. The color of the label can be made to indicate the group, as blue for ferns, etc. The specimens should never be wet, oiled, or varnished.—F. L. HARVEY.

The directions which Prof. Harvey gives for collecting in carboniferous strata apply in the main to all formations.

Drying plants out of doors in wet weather.—For 30 years I have collected plants in both wet and dry climates and of necessity have tried many plans. At present I have, I think, a perfect system and as it is all original I will give it in full. I have tried all other plans and none meets every case but my own. When out collecting I gather flowering plants in dry weather, and lichens, mosses and liverworts wet, especially lichens. My driers are either newspapers or the usual ones advertised in the GAZETTE. I collect cryptogams in a basket, and afterwards sort them and place them in flattened pieces or tufts on single sheets of paper of a slightly smaller size than the driers. I fill each sheet, taking no account of species, and place on it a slip with the date. I place each sheet between driers and when all are assorted I place the pile between boards and put on the pressure with leather straps.

Next morning when the sun gets hot I, or my man, take the parcel to an open and level place, spread out a water-proof sheet black side up and carefully taking off each sheet of specimens slide it into position on the waterproof, one of which will hold twenty-four sheets of specimens. I put small stones and sticks on the corners and so leave them exposed to the sun. In a very short time they are dry and at once packed away. In the winter I assort them. This plan *in part* I have practiced since 1875, when in northern British Columbia where the weather was so wet that we had rain every day during the month of June.

My plan for phænogams and mosses was only perfected last year, and for phænogams would be of no use without the thick and heavy driers. For the past four years I have been in the habit of placing my sheets of specimens when partly dry on a level surface of dry rock, earth or sand, and then exposing them covered with a single drier to the sun. This worked well in dry weather, but when everything was wet we could do nothing. Last June I was collecting in the Rockies and had showers four or five times a day, so that I could get no dry places for my plants. I had two wire presses, but they were too full, and the air was almost at the point of saturation. One day I spread out my plants in my old way and a thunder storm coming up I hastily covered them with my waterproof sheets. Five minutes after the rain cleared off the waterproof was dry. I now changed my tactics and put the waterproof beneath and I had beaten both weather and locality.

My plan for phænogams in full is this: I carry my driers and half sheets always with me when collecting. My whole outfit is a knife, a basket and a portfolio or press made of two boards of three-ply veneers with straps to fasten them together. I gather my specimens and place them on the half sheets while they are quite fresh, in fact they are put in the press as soon as collected. I keep the collection of each day by itself. Every morning before leaving camp I go over all the specimens *exposed* the day before and label and put away the dry ones, while the others are again exposed.

No matter how wet the weather may be, if I can get three hours' sunshine I can dry my plants without any difficulty. I usually keep my plants one day in the press before exposing them, as I find if they have not had time to wilt they curl in drying.

Let the ground be wet or dry I clear off a space for one or two waterproofs and lay them down with the black side up. As soon as they are warm I unstrap my press, taking a half sheet and drier (drier on top) and place them on the waterproof in rows. Each one holds about twenty-four. I now lay small sticks or stones on the margins or corners and leave them for three or four hours. They are again taken up and put in press until the next morning, when the dry ones are labeled and put away, while the others are again exposed.

By the methods given above I dried over 1,500 sheets last year in a wet region and all my specimens kept their color, although for weeks together it rained every day.—JOHN MACOUN.

Herbarium cases.—I make my cases low enough so that one can easily reach the uppermost specimens without leaving the floor. The pigeon-holes